

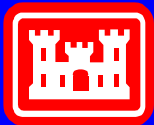
Site Management System for Multiple Fuel Cell System Operation (and other DoD Fuel Cell Program Highlights)

Dr. Michael J. Binder

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Michael.J.Binder@erdc.usace.army.mil

F-CELLS *WEEK*
Holiday Inn, Victoria
London
October 19, 2000

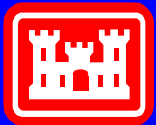


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Presentation Outline

- Site Management System (SMS) & USPS 1 MW Demonstration Project
- PAFC 200 kW Demonstration Program
- Climate Change “Rebate” Fuel Cell Program
- DoD Fuel Cell Test and Evaluation Center (FCTEC)

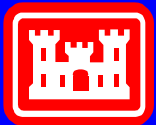


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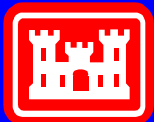
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Site Management System (SMS)

- **Multi-Unit Load Share**
 - ✓ Parallel Fuel Cell Installations
- **Seamless Transfer Capability**
 - ✓ Instantaneous Backup Support for Critical Loads
- **Field Demonstration - U.S. Post Office, Anchorage, AK**
 - ✓ Five ONSI PC25 Fuel Cell Power Plants



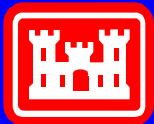
SMS Factory Test



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SMS Installed

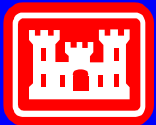


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Customer Needs

- **U.S. Postal Services Main Processing Center in Anchorage Experienced Frequent Momentary Outages**
 - **Caused Shutdown of Mail Sorters**
 - **Elapsed Time to Clear and Restart-- 2 Hours**
 - **Lost Productivity and Time**
- **Concurrently, Facility Needed to Replace Back-up Diesel / Generator and Inadequate Ups System**



System Operational Parameters

Electrical - Normal

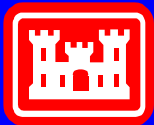
- Operates in Parallel to Grid
- Provides All Power to Facility (~ 800 kW Peak)
- Provides Excess Power to Chugach Grid

Electrical - Grid Outage

- Operates Grid Independent; Provides All Facility Power
- Transfers Seamlessly (1/4 Cycle); No Equipment Outages
- Units Share Facility Load (Multi-unit Load Share Option)
- Replaces Existing Diesel Generator Set and UPS

Thermal

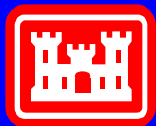
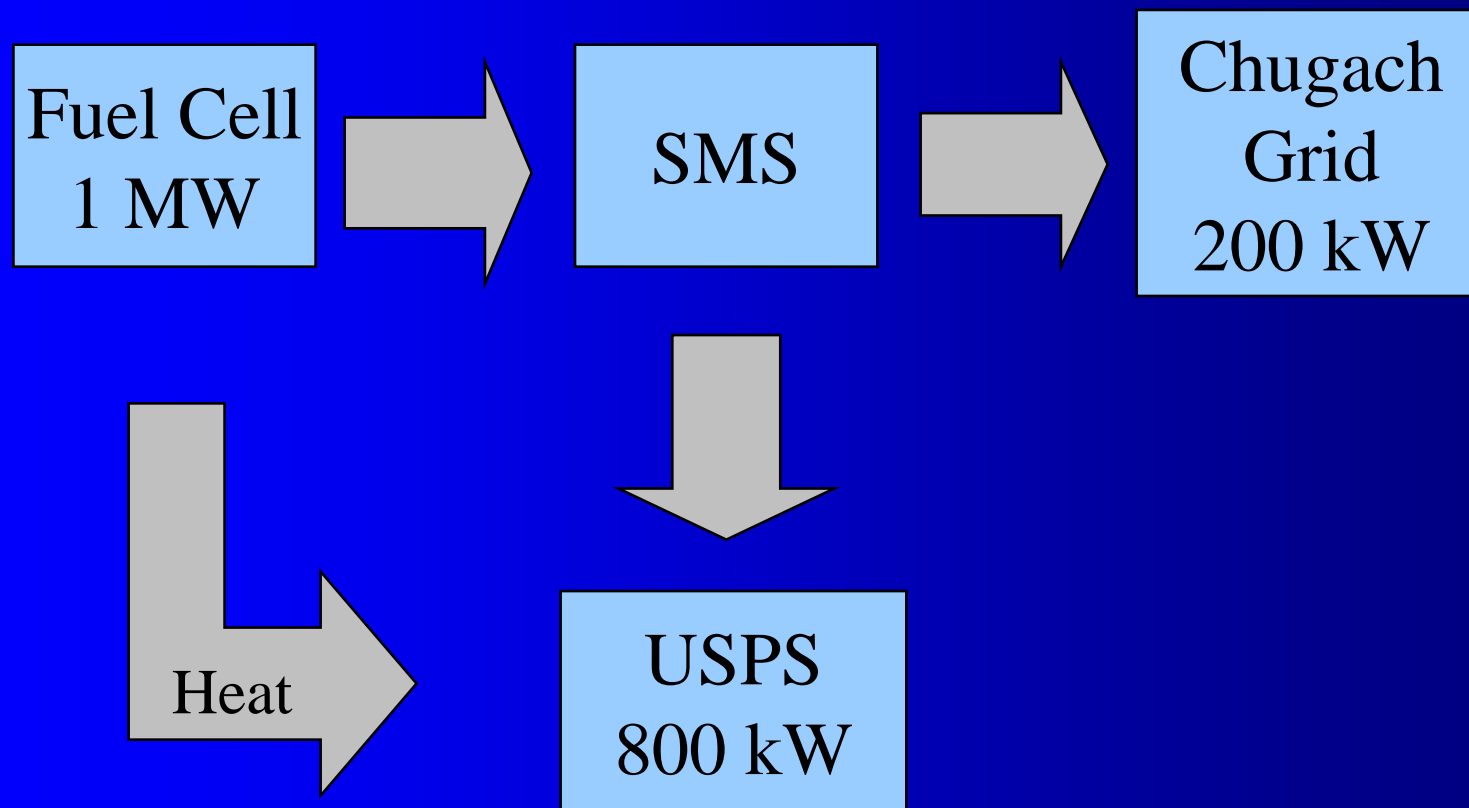
- Provides Facility Heating With PC25 C High Grade Heat Option



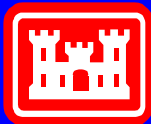
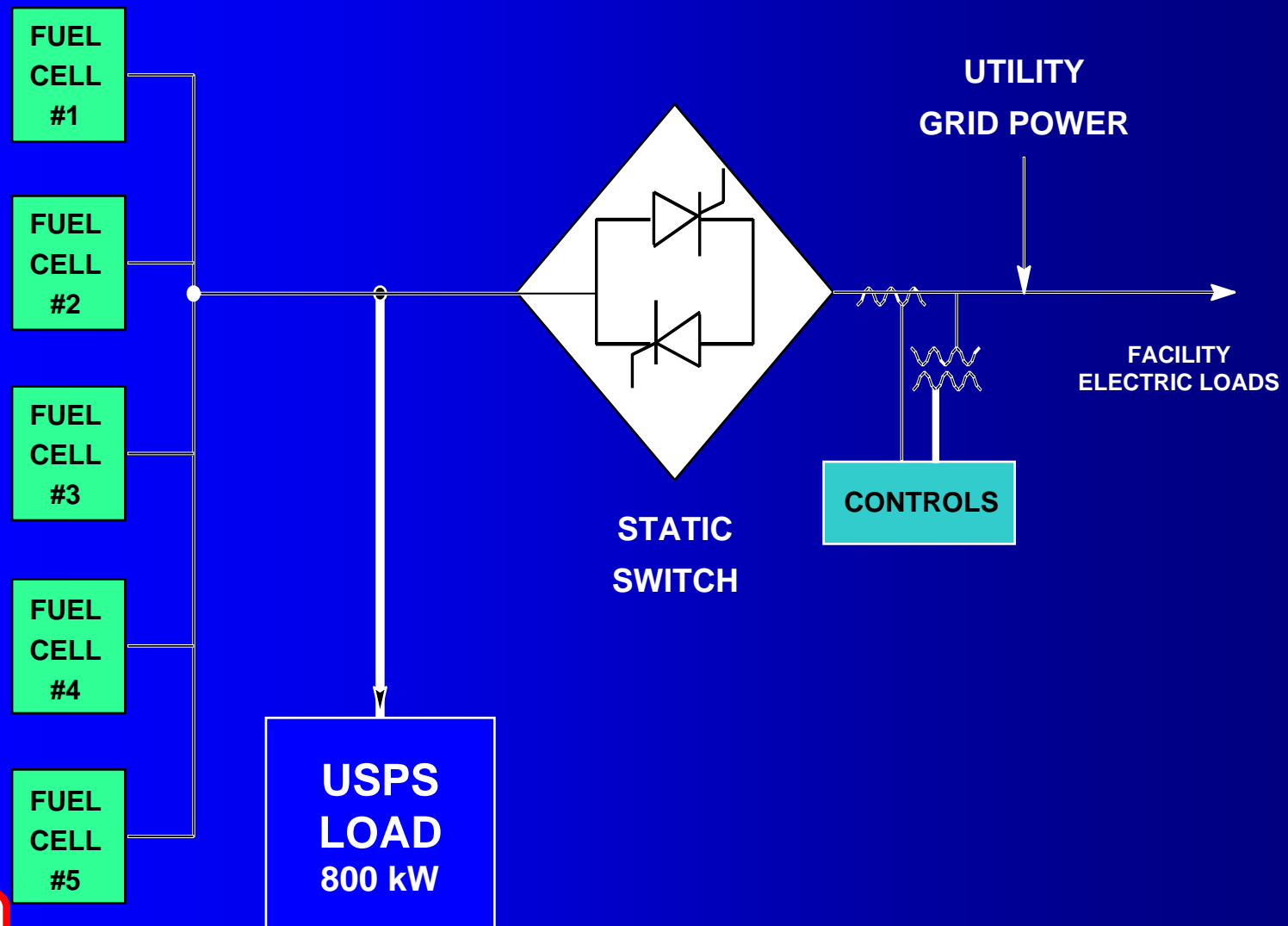
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System Block Diagram



MULTIPLE UNITS ASSURED POWER / GRID CONNECT / SEAMLESS TRANSFER

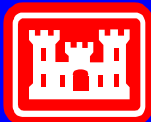


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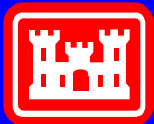
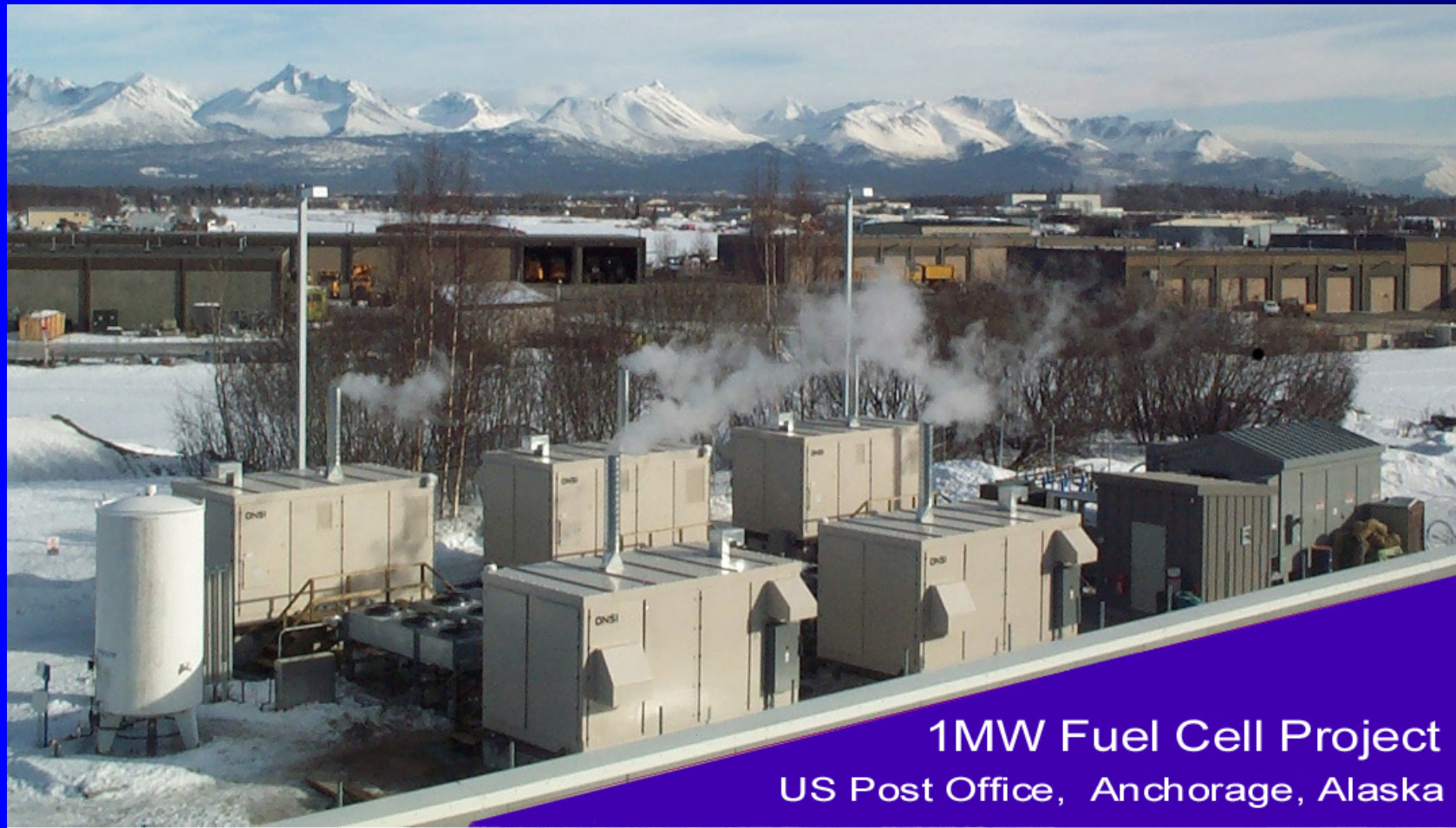
LOSS OF GRID TRANSITION

Test Results



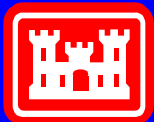
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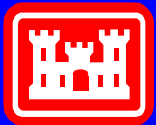


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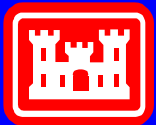
Project “Firsts”

- 5 PC25 Unit Installation at Single Site
- Multi-unit Load Share and Site Management System (SMS) for Control
- Use of Fuel Cell Installation As Distributed Generation Asset by Local Utility
- Power Continuity to Load Using Seamless Transfer (1/4 Cycle Transition)
 - Grid Parallel to Grid Independent, and
 - Grid Independent to Grid Parallel



Participants

- Chugach Electric Association, Inc.-- Largest Utility in AK; Owner of Power Plants
- US Postal Service -- End-use Customer / Site
- US Department of Defense -- Technology and Grant Resources
- ONSI Corporation
- Cooperative Research Network of the National Rural Electric Cooperative Association (NRECA)
- Electric Power Research Institute (EPRI)

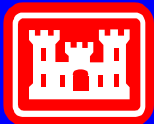


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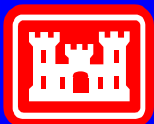


Dedication Ceremony-- 09 AUG 2000



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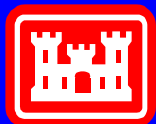


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Ribbon Cutting -- 09 AUG 2000

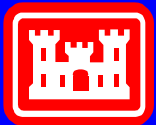


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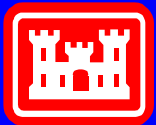


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DoD PAFC 200 kW Fuel Cell Demonstrations

- **DUECC Request for CERL Assistance**
- **FY93 Congressional Appropriation - \$18M**
- **FY94 Congressional Appropriation - \$18.75M**
- **Specify “...natural gas fuel cells in production in the United States...”**

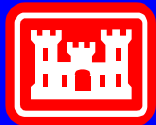


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DoD PAFC 200 kW Fuel Cell Demonstrations

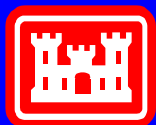
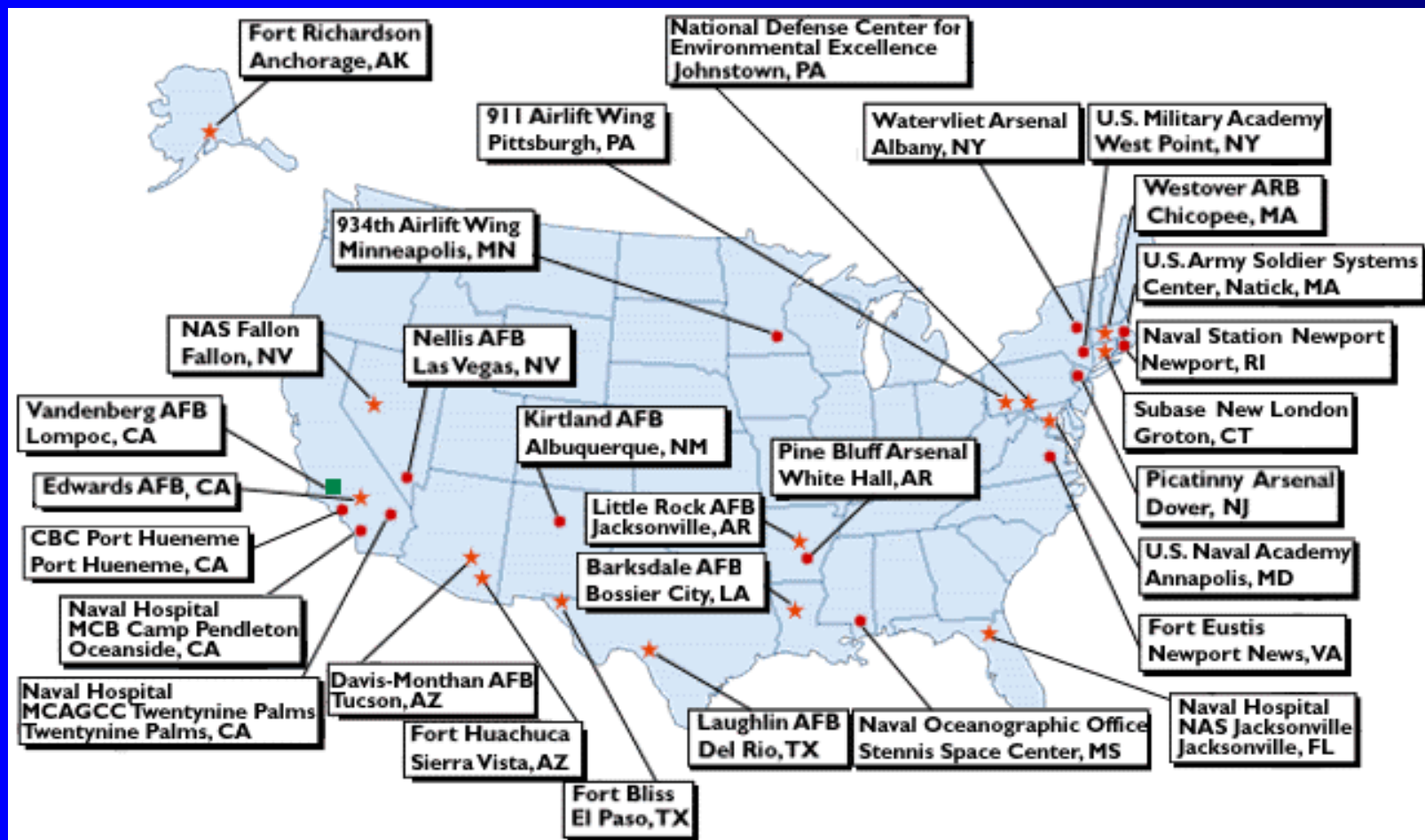
- **30 ONSI PC25 Fuel Cell Power Plants**
 - ✓ 15 Model C, 14 Model B, 1 Model A
- **Turn Key Packages**
- **Application/Geographic/Climatic Diversity**
- **Continued Performance Monitoring**
- **Product Improvement Feedback**



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PC25 POWER PLANT DoD SITES

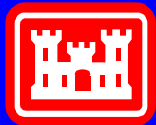


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PC25 B Installed at Picatinny Arsenal, NJ



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Facility Applications

- **Central Heat Plants**

11 Sites



- **Hospital Utility Plants**

7 Sites



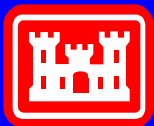
- **Pool / Gymnasiums**

3 Sites



- **Others**

Barracks, Dining Facility, Laundry,
NG Armory, Launch Control Bldg.,
Office, Evaporator process

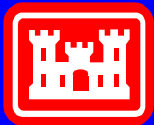
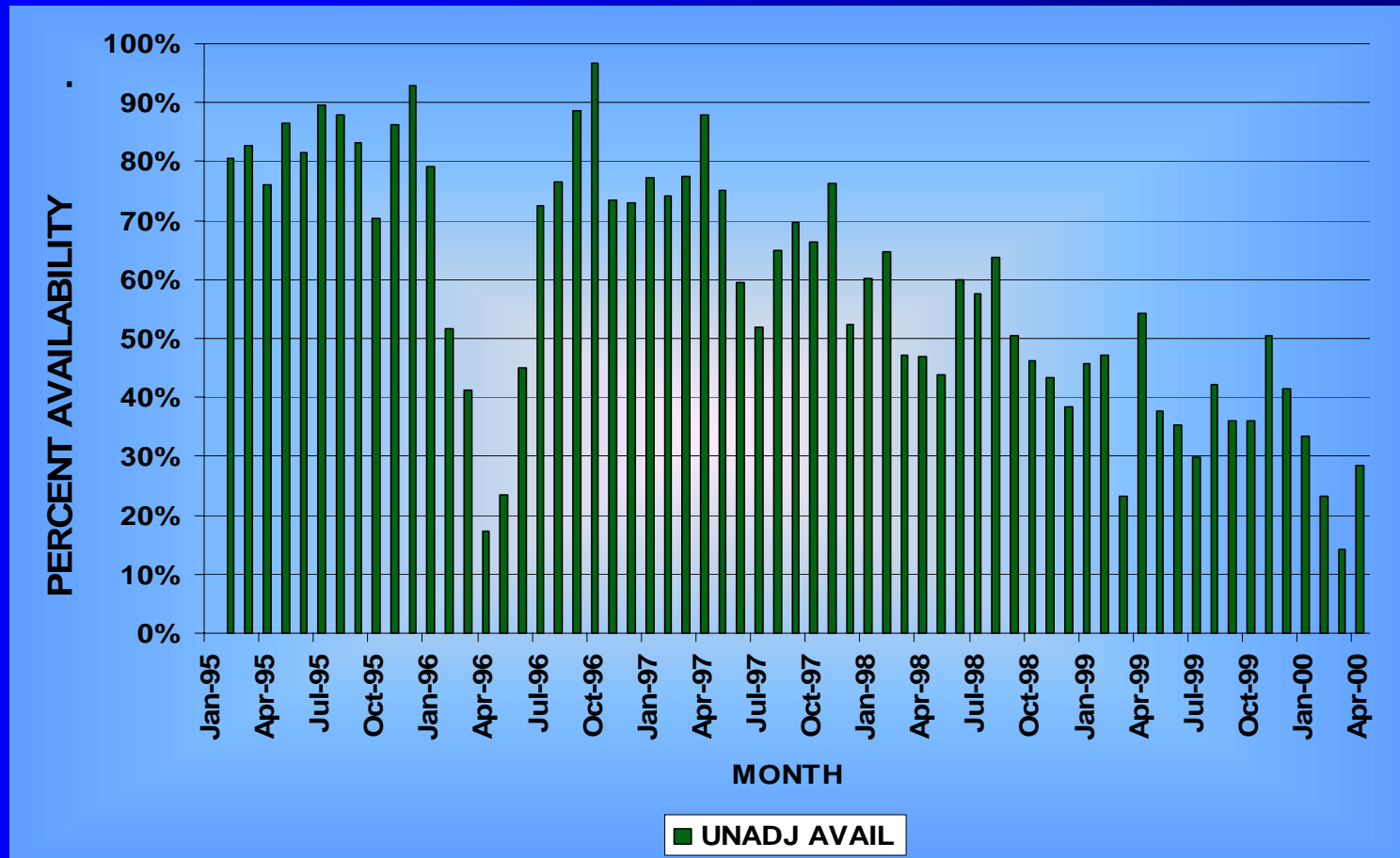


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PC25B Availability

Monthly for Entire B Fleet

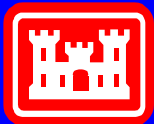
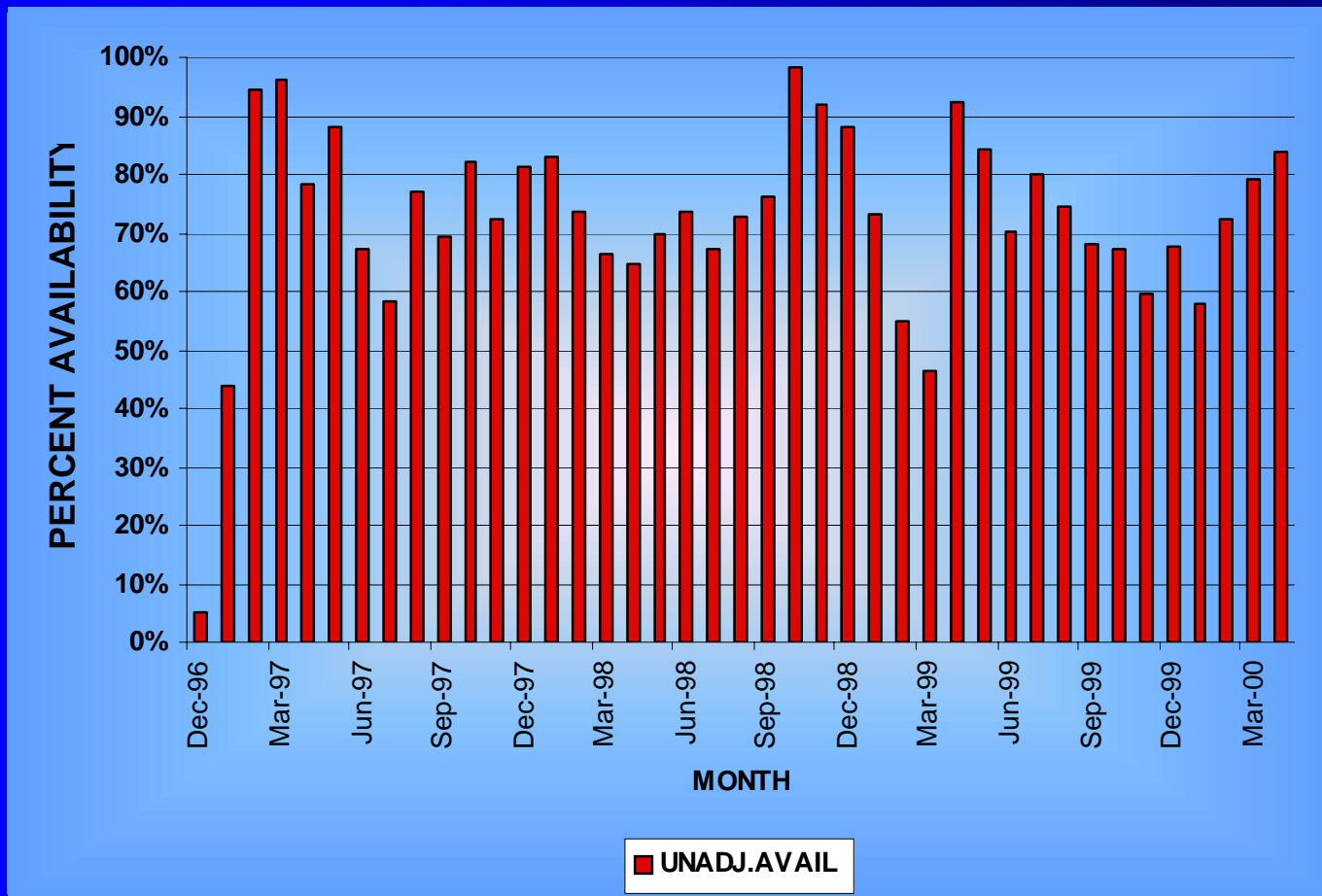


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PC25C Availability

Monthly for Entire C Fleet



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Fleet Performance Summary

(29 Power Plants)
As of 1 September 2000

- Total Run Time 614,658 hrs
- Unadjusted Availability
 - Model B Fleet 54%
 - Model C Fleet 77%
 - Model C Fleet (6/00 - 9/00) 87%
- Energy \$ Saved \$4,144,645
- NOx Abated 197 tons
- SOx Abated 422 tons
- CO Abated 17 tons
- CO₂ Abated 25,001 tons

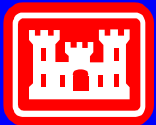


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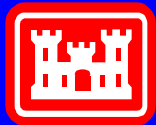


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Climate Change “Rebate” Program Objectives

- Reduction of Fuel Cell Prices via Economy of Scale
- Proactive Approach for DoD Involvement



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“Rebate” Program Highlights

- **Grant Money Available / Fiscal Year**

| | |
|-----------|-----------------------|
| ✓ FY00 | \$ 2.0M (approximate) |
| ✓ FY99 | \$ 2.3M |
| ✓ FY98 | \$ 4.2M |
| ✓ FY96/97 | \$10.6M |
| ✓ FY95 | \$ 8.2M |

- **Cost-Shared Program Incentives**

- ✓ \$1,000 / kW up to 1/3 of the total cost

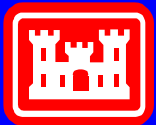


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Application Rating Criteria

- Firmness of Financial Commitment (40%)
- Site Information (20%)
- DoD Relationship (20%)
- Uniqueness of Project (20%)

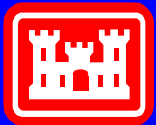


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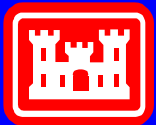
FY1999 Program Results

- Managed by USACERL
- Executed by NETL
- Rebates awarded for:
 - ✓ 10 IdaTech 3 kW PEMFCs
 - ✓ 23 Plug Power 7 kW PEMFCs
 - ✓ 8 ONSI 200 kW PAFCs
 - ✓ 1 Siemens-Westinghouse 250 kW SOFC
 - ✓ 1 Fuel Cell Energy 250 kW MCFC



“Rebate” Program Additional Information

- Check the following links late 2000 / early 2001 for additional information on the FY00 Rebate Program:
 - www.netl.doe.gov/business/solicit/index.html
 - www.dodfuelcell.com/updates.html

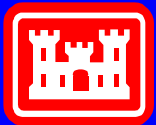


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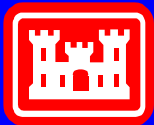
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DoD Fuel Cell Test & Evaluation Center (FCTEC)



FCTEC Site - Johnstown, PA

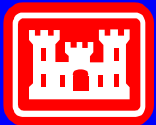


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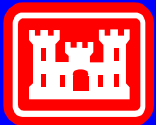
FCTEC Description

- The FCTEC is located in Johnstown, PA at Concurrent Technologies Corporation's (CTC's) Environmental Technology Facility.
- The FCTEC is a National Resource for the independent, unbiased testing and validation of fuel cell power plants for military and commercial applications.
- FCTEC's primary goal is to significantly accelerate the development and commercialization of fuel cell power plants.



FCTEC Services

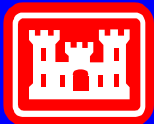
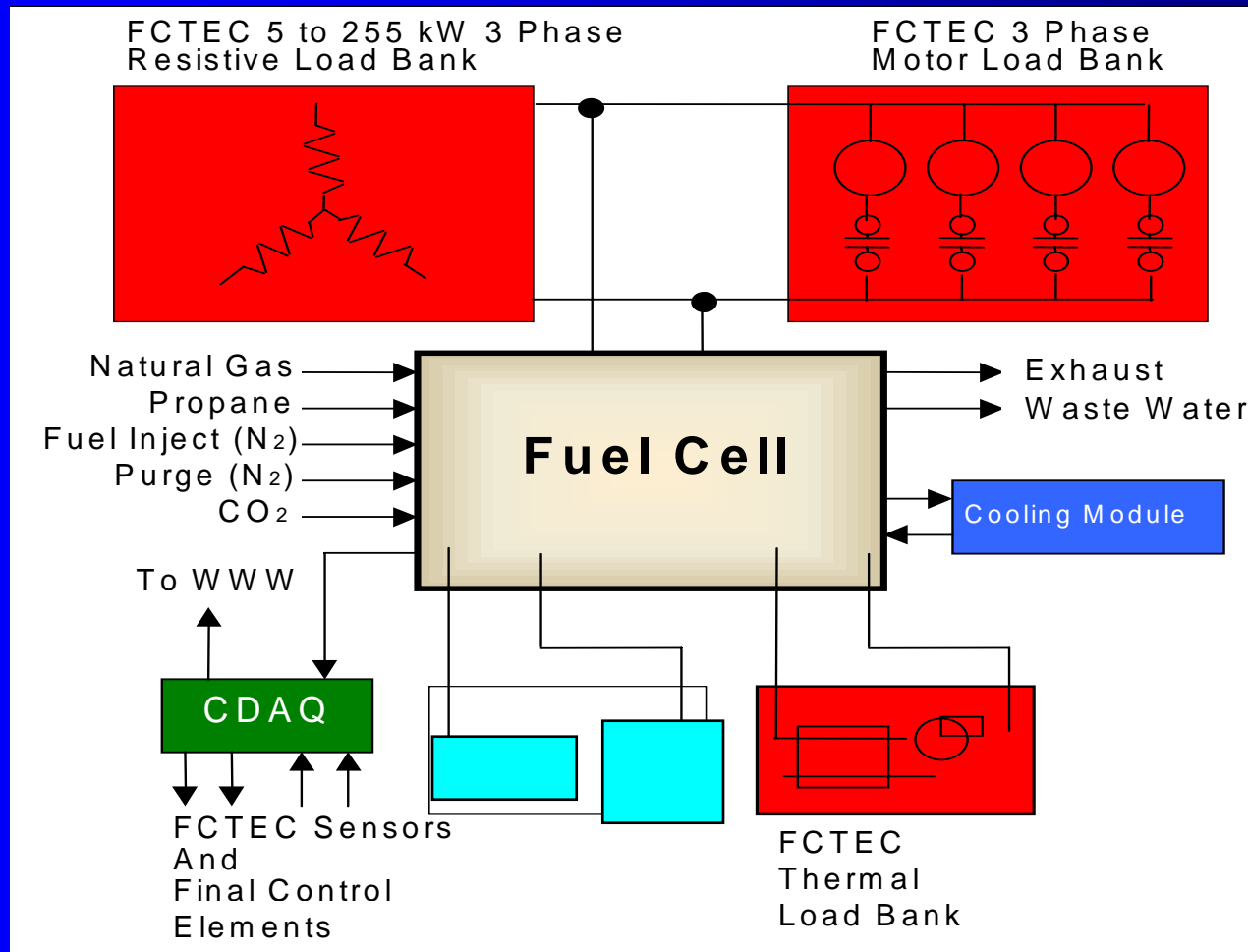
- Independent Demonstration and Validation of Fuel Cell Power Plants Up to 300 kW
- Testing Fuel Cells Continuously, 24 Hours a Day, 7 Days a Week
- Providing Computerized Process Control and Data Acquisition Capability Including Protected, Internet Data Access
- See Brochure for Specific Testing Capabilities



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FCTEC Block Diagram



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Indicates Future Test
Apparatus / Equipment

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FCTEC Example Test Skids



Dynamometer Skid



Pump Skid



Fan Skid

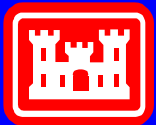


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FCTEC - Benefits

- **Accelerated Development of Fuel Cell Power Plants**
- **Access to Both Government & Industry Clients**
- **Designed for Simple Operation, Maximum Flexibility**

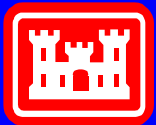


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FCTEC Additional Info

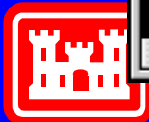
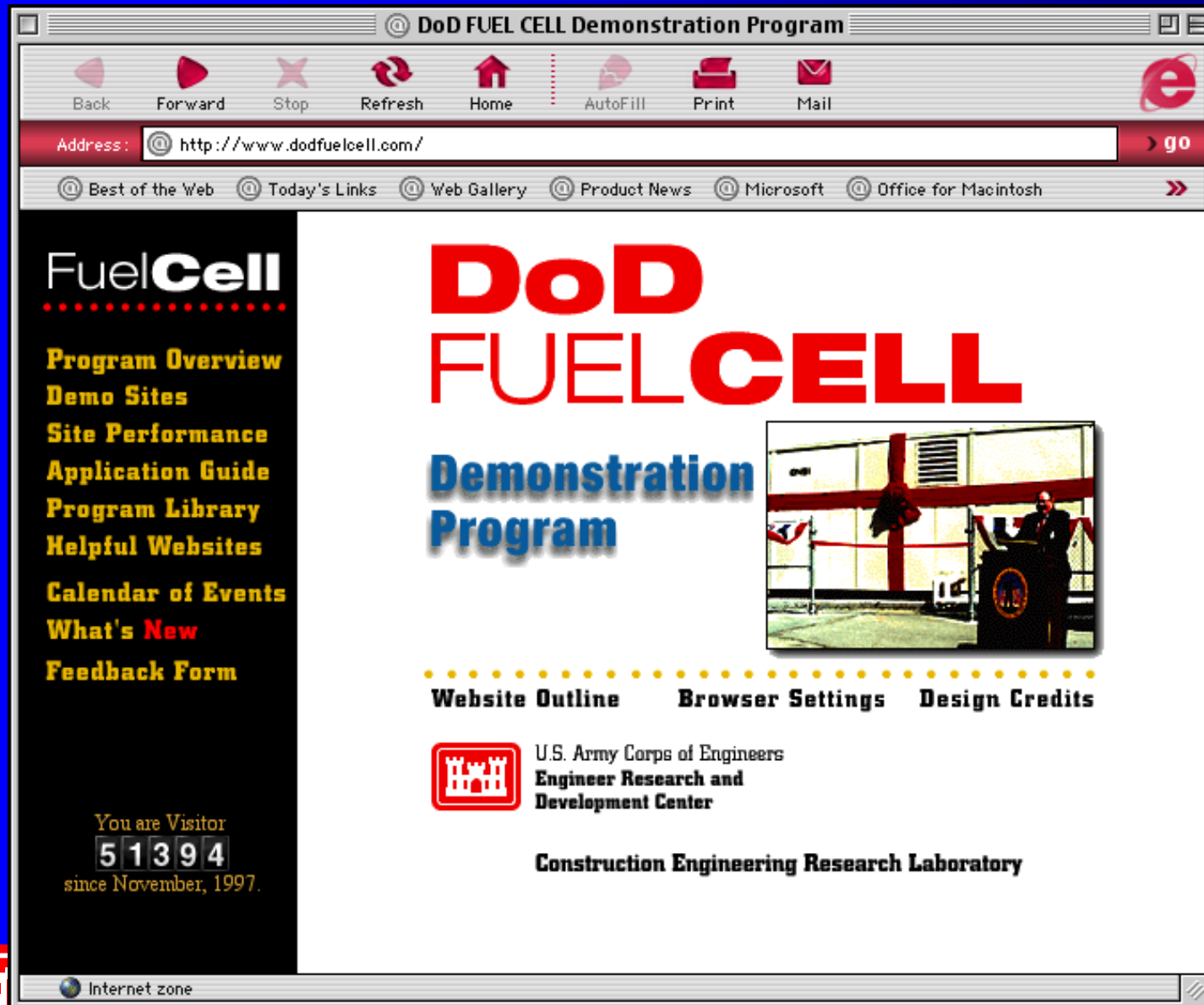
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